

Developer's Interface Guide For IA-64 Servers:

Speeding the Development and Deployment of Intel® Itanium™ Processor-Based Server Solutions

This important new specification is helping designers streamline the development of robust, interoperable server solutions based on the new Intel® Itanium™ processor and will allow IT professionals to deploy these solutions with increased confidence. Read this whitepaper to see how the DIG64 increases the efficiency of the design process, allows software development to proceed concurrently with the hardware, and makes it easier to transition away from obsolete technologies and take advantage of newer ones.

Executive Summary

Critical concerns such as time to market, reliability, legacy management, compatibility, and performance are heightened when industry solutions are delivered on a new platform architecture. For the IA-64 microprocessor architecture, leading platform, OS, firmware, and device manufacturers have worked collaboratively to address these and other issues head on, to pave the way for efficient and productive development of reliable, compatible solutions that meet the high standards of IT departments.

Now available in Release 1.0, the *Developer's Interface Guide for IA-64 Servers (DIG64)* sets a new industry standard for the development of server solutions based on the Intel® Itanium™ processor and subsequent processors in the IA-64 family. The DIG64 is an operating-system-independent reference guide that establishes basic system building blocks, required and optional interfaces, and programming conventions between IA-64 based servers and system-level software such as the operating system and device drivers.

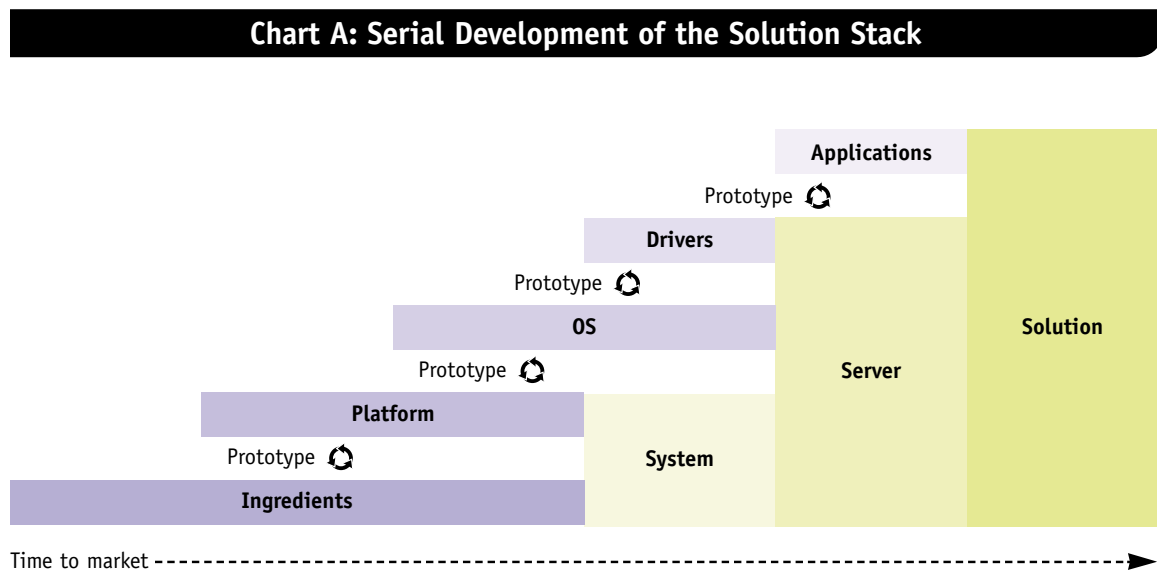
Vendors that take advantage of the DIG64 can accelerate their development of Intel Itanium processor-based products and solutions, and create designs with increased longevity. In addition, because the DIG64 fosters a wealth of robust, compatible and interoperable server solutions, information technology (IT) departments that specify DIG64-compliant server solutions can reduce qualification cycles support costs.

Traditional Solution Stack Development

The Intel Itanium processor and the IA-64 architecture enable breakthrough levels of performance, scalability, and cost-effectiveness in the upper-midrange server market segment. The Itanium processor and its successors open additional market segments to vendors of Intel-based server systems and peripherals, and provide an affordable, high-powered platform on which to run mission-critical business applications.

But with any new processor architecture, comprehensive answers to customers' computing needs have to wait until the underlying solution stack—including processors and chipsets, platforms, operating systems, device drivers and other system software, and finally applications—is in place.

The development of the server solution stack has traditionally been a time-consuming, serial process, in which each layer must be designed and prototyped in turn (see Chart A).

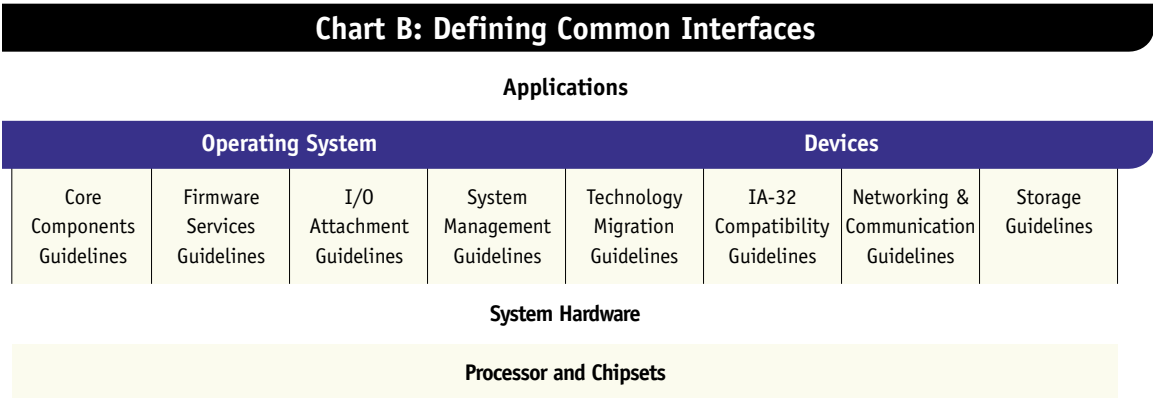


In addition, to achieve compatibility and interoperability between layers, vendors must make numerous design decisions about which of many possible interfaces to support. In the 32-bit world, a large installed base has resolved such issues by establishing a de facto baseline system. With a new processor architecture, however, developers can't simply "design to the status quo," because the status quo hasn't been established yet.

Without widespread agreement on the interfaces between the server and system software layers, each vendor must choose from among many possible approaches and corresponding interfaces. Typically, vendors must make individual decisions about which legacy interfaces to support, and resolve compatibility issues through repetitive design iterations with many other vendors. The resulting process is not only costly and time-consuming but also inefficient and error-prone. It produces delays in getting solutions into customers' hands, drives up the costs of development, and increases the likelihood of compatibility and support problems.

The DIG64 Moves the Industry to Concurrent Solution Stack Development

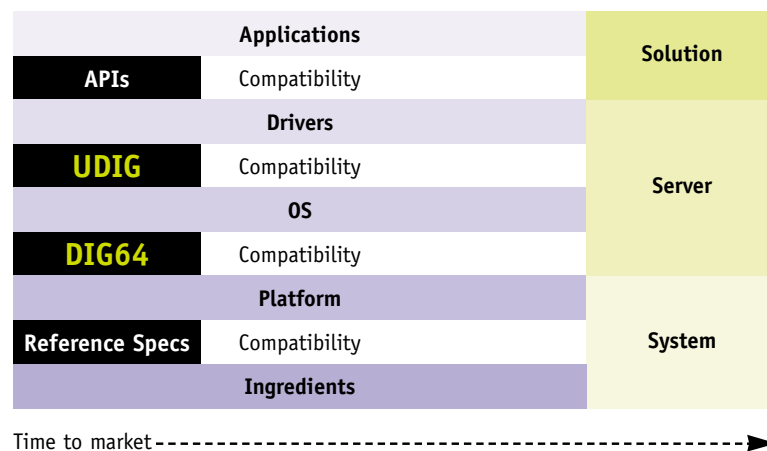
To alter this scenario, an open, broad-based coalition of server hardware manufacturers, operating system vendors, BIOS vendors, application software vendors, and peripheral hardware manufacturers came together to define a common framework for IA-64-based servers. The result of their efforts, the *Developer's Interface Guide for IA-64 Servers Release 1.0*, addresses issues that arise at the interface between system hardware on the one hand, and operating systems, devices, and applications on the other, for Intel Itanium processor-based servers (Chart B).



The DIG64 defines a common set of interfaces between the server system hardware and the operating system and devices.

The DIG64 R1.0 defines basic system building blocks, required and optional interfaces, and programming conventions, and in doing so, enables the industry to move beyond the traditional, serial development process. Instead, as Chart C shows, system and software development can proceed concurrently with processor development, saving countless hours of one-on-one design and coordination effort and accelerating the availability of high-quality, interoperable servers, peripherals, operating systems, and applications based on the Intel Itanium processor. The DIG64 also enables IT departments to deploy IA-64-based servers and software with confidence, knowing that system elements, interfaces, and products are designed from the outset to fit together and operate reliably.

Chart C: Concurrent Development of the Solution Stack



The DIG64 Provides a Rational Basis for Technology Transition

A new microprocessor architecture also offers a unique opportunity to address a second key aspect of system design: which legacy technologies should be carried forward to a new generation of platforms? Legacy technologies, which range from obsolete bus architectures to outdated boot procedures, impose burdens on system and OS designers as well as IT departments. Including them:

- Raises system and support costs by causing systems to be more fragile and less robust.
- Inhibits design flexibility and makes it harder to take advantage of newer approaches.

The DIG64 industry working group is a neutral forum in which industry representatives can work cooperatively to reexamine and update legacy technologies and take a rational approach to decisions about which technologies to retain. In defining standard building blocks and interfaces, the DIG64 identifies out-of-date

technologies to be avoided and provides a road map for gradually phasing out these technologies, the better to make way for newer, more robust, and more innovative approaches. Because legacy issues have been addressed proactively, the DIG64 helps ensure that Itanium processor-based system designs and decisions have been well thought out. In addition, by removing unneeded legacy technologies, the DIG64 fosters innovation and flexible designs and reduces the costs of supporting outdated technologies.

Note that in developing the DIG64 the industry working group did not create new standards and interfaces but established required and optional interfaces by choosing from among currently available technologies. In addition, vendors are free to decide how quickly they want to move toward discontinuing their support for obsolete technologies.

Along with defining system building blocks and interfaces, the DIG64 also provides:

- Development tools to assist vendors in migrating to Intel Itanium processor-based platforms.
- Detailed test criteria and validation test suites (including interoperability tests) that offer vendors and customers the assurance that products are in conformance with the specification.
- A three-year, high-level road map to help developers plan and create reusable, longer-lasting designs that will evolve in step with the system architecture.

Scope of the DIG64 R1.0

System Element	DIG64 Content
Base System Modules	
Core components	Describes hardware and software structures used to build IA-64 systems
Firmware services	Names and positions specifications that define IA-64 firmware services
I/O guidelines	Addresses I/O subsystems
System management	Describes a set of features and functions to establish baseline management capabilities
Technology migration	Addresses the migration of legacy hardware, firmware, and software
IA-32 compatibility	Provides optional guidelines for supporting IA-32 operating systems
Components Modules	
Networking & communications	Specifies minimum guidelines for attaching networking and communication peripherals through the standard system bus
Storage	Specifies minimum guidelines for attaching storage peripherals through the standard system bus

DIG64 Benefits: What's In It for You?

The DIG64 makes a pre-emptive effort to forestall technology transition problems, and helps to ensure stability in the interfaces that underlie the development of operating system elements, drivers, and applications. As a result, the DIG64 specification delivers substantial benefits to IT departments that specify DIG64-compliant server solutions, as well as to system, peripheral, and software vendors that adopt the DIG64.

IT Departments and Business Users

The DIG64 provides a higher degree of standardization at the base system level. For businesses, this serves to:

- **Simplify qualification.** Having stable, consistent interfaces between operating systems, devices, and system hardware should reduce the effort, time, and expense needed to qualify new systems that comply with the DIG64 specification.
- **Lower support costs.** Stable, compatible interfaces and a rational approach to managing legacy technologies leads to more reliable, interoperable products that are less costly to deploy and support. The collaborative efforts to forestall legacy problems should also reduce upgrade and maintenance costs.
- **Make available a wider range of available solutions.** Well-defined interfaces should speed the development of reliable, interoperable products, giving businesses greater choice and flexibility in choosing the right combination of products that meet the needs of IT organizations and business end users.

Server Platform Vendors

The DIG64 provides system developers with stable, testable hardware interfaces and allows for informed management of legacy issues. This enables server platform vendors to:

- **Streamline the design process.** Stable, testable hardware interfaces and consensus on legacy issues can shorten design cycles and cut time to market, as well as reducing system complexity and lowering the costs of design, testing, and support. The DIG64's three-year technology road map also helps vendors design for increased longevity, further reducing development costs and rework.
- **Realize a faster ROI.** Faster availability of a wide range of solutions will help the Itanium processor-based server market segment reach critical mass quickly. Along with faster times to market and more efficient design cycles, this can lead to a faster return on investment.
- **Increase time and resources for value-added development.** With common, accepted interfaces already defined, vendors can capture time previously spent on interface planning, design, and support, and spend it on design efforts and value-added features that differentiate the vendor's products in the marketplace.

- **Innovate more readily.** The open, industry-wide process of evaluating design alternatives and legacy support frees hardware vendors from the burden of independently evaluating and supporting obsolete technologies at the expense of incorporating new innovations.

Operating System Vendors (OSVs)

The standard hardware interfaces defined in the DIG64 can shorten time to market for 64-bit operating systems and reduce porting efforts needed to support multiple vendor platforms, and provide additional system-level support for operating system RAS (reliability, availability, and serviceability) requirements. The upshot is that the DIG64 helps operating system vendors to:

- **Increase development efficiency.** The DIG64 reduces the time needed for porting and redesign to support unique interfaces. Instead, vendors can dedicate more resources to product differentiation and value-added enhancements.
- **Reduce complexity.** OSVs can anticipate and “manage” legacy issues rather than reacting to them after they emerge. This helps reduce design complexity and engineering work moving forward.
- **Enjoy a larger potential market for their OS products.** The DIG64 promotes a broader range of compatible Itanium processor-based platforms for operating system vendors.

Independent Hardware Vendors (IHVs)

The DIG64 ensures that core OS functionality will work across a broad set of IA-64-based server systems. This means that IHVs can:

- **Extend their product reach and reduce design effort.** By designing their devices to conform to the DIG64 specification, IHVs can ensure that their products will work across all IA-64-based servers that conform to the specification. This minimizes porting efforts needed to support multiple vendors’ platforms, and promotes both a faster ROI for vendors and a broader array of choices for customers.
- **Shrink time to market.** Common, clear interfaces and legacy management make it easier to verify interoperability, thus reducing both design testing and the time and expense of rework.
- **Reduce ongoing support costs.** Defined compatibility should result in fewer versions of the same product and hence reduce ongoing support resource requirements.

Independent Software Vendors (ISVs)

The DIG64 ensures a better match of hardware to application requirements, and in turn higher performance and simplified development efforts. The DIG64 allows ISVs to:

- **Accelerate application design efforts and time to market.** With a common baseline platform, ISVs gain early access to stable system interfaces from all the leading server manufacturers’ products. This provides a broader customer base, with less effort, for their solutions software, and makes it possible to accelerate time to market.

- **Lower their support and maintenance costs.** Common interfaces, along with intelligent legacy management, means fewer variations from one platform to the next, which can lead to significant reductions in support expense for application developers.
- **Benefit from improved performance modeling.** A common, baseline platform makes it possible for the first time to accurately predict application performance across multiple platforms.

Join other industry leaders in building compatible IA-64 server solutions

In today's dynamic e-business environment, the demand for high-performance, high-availability servers is greater than ever. The Intel Itanium processor and subsequent members of the Intel IA-64 processor family deliver unparalleled performance and availability and a wealth of features tailored to the needs of the e-business customer. The *Developer's Interface Guide for IA-64 Servers* is a critical specification that is already speeding the development of complete IA-64 solution stack and laying the groundwork for a thriving market segment of robust, cost-effective solutions based on the Intel Itanium processor.

Whether you're developing server platforms, operating systems, applications, peripherals, or other server-oriented software or hardware, the DIG64 can help your company take advantage of the opportunities presented by the introduction of the Intel Itanium processor and the IA-64 microprocessor architecture. Through its proactive management of legacy technologies and its open, industry-wide definition of compatibility between server hardware and system software across IA-64 servers, the DIG64 is helping to:

- Accelerate the availability of mission-critical solutions on IA-64 servers.
- Increase IT's confidence that IA-64-based server solutions will integrate and interoperate compatibly.
- Promote efficient design processes that optimize product development resources, reduce design rework, and lower development costs.
- Enable smoother technology transitions, foster innovation, and encourage the creation of innovative design solutions.

To reap the rewards of the DIG64, start immediately to plan your IA-64 development strategy around the DIG64 specification. Visit the DIG64 Web site, <http://www.dig64.org>, and become an adopter of the DIG64. And bookmark the site to take advantage of downloadable SDKs, sample RFPs, and reference implementations as they become available. Don't delay.

www.dig64.org

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